



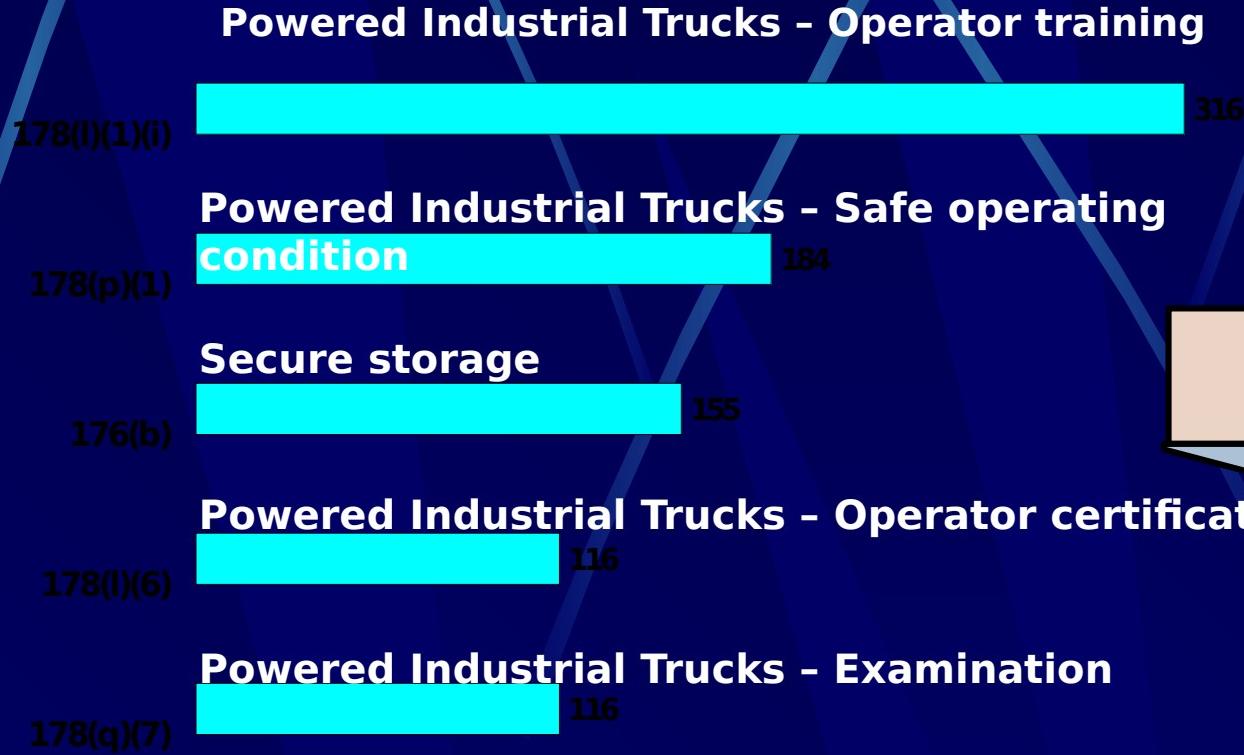
# Material Handling Subpart N

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# **Subpart N - Materials Handling & Storage (1910.176 - 184)**

Standard:  
**1910.**



# General

- Everyday
  - Transport
  - Handle
  - Store
- Means
  - Manual
  - Power

# Covers

- 1910.176 - Handling Materials, General
- 1910.177 - Servicing multi-piece & single piece rim wheels
- 1910.178 - Powered Industrial Trucks
- 1910.179 - Overhead and gantry cranes
- 1910.180 - Crawler locomotive and truck cranes
- 1910.181 - Derricks
- 1910.183 - Helicopters
- 1910.184 - Slings

# Objectives

- Identify general requirements
- Identify servicing requirements for single-piece and multi-piece rim wheels
- Identify inspection design and operation requirements for:
  - Powered industrial trucks
  - Overhead and gantry cranes
  - Crawler, locomotive, and truck cranes
  - Derricks
  - Slings

# Objectives (cont.)

- Identify communication, load handling, and protective requirements for helicopters

# General Requirements

## 1910.176

- Mechanical equipment usage
- Aisles and passage ways
  - Permanently marked
  - No obstructions
- Secure storage
  - Shall not create a hazard
  - Tiers:
    - Stacked
    - Blocked
    - Interlocked
    - Limited in height

# General Requirements 1910.176 (cont.)



# General Requirements 1910.176 (cont.)

- Housekeeping
  - Kept free from materials creating hazards of the following:
  - Tripping
  - Fire
  - Explosion
  - Pests

# General Requirements 1910.176(cont.)

- Clearance Limits
  - Warning signs
- Rolling rail cars
  - Bumper blocks
  - Where car could:
    - Contact another car
    - Enter a building, work, or traffic area

# General Requirements 1910.176 (cont.)

- Guarding
  - Covers or guardrails to protect personnel from:
    - Open pits, tanks, vats, ditches, etc.

# Multi-Piece and Single-Piece Rim Wheels

## 1910.177

- Hazards
- Employee Training
- Service Equipment
- Multi-Piece Rim Wheel – Safe Operating Procedure
- Single-Rim Wheel – Safe Operating Procedure
  - In 1984 OSHA Amended the Standard to Include Single-Piece Rim Wheels

# Multi-Piece and Single Rim Wheels

## 1910.177 (cont.)

- Standard Includes:
  - Large Trucks
  - Buses
  - Trailers
  - Off-road Machines
- Does Not Include:
  - Automobile Tires
  - Light Truck Tires - Designated “LT”



# Multi-Piece and Single Rim Wheels

## 1910.177 (cont.)

- Rim Wheel – A component assembly of wheel, tire, tube, and other components.
- Single- Piece Rim Wheel – A single-piece wheel is the component of the assembly used to hold the tire, form part of the air chamber (with tubeless tires), and provide the means of attachment of the assembly to the vehicle axle.

# Multi-Piece and Single Rim Wheels

## 1910.177 (cont.)

- A multi-piece wheel is a vehicle wheel consisting of two or more parts, one of which is a side or locking ring that holds the tire and other components on the rim wheel by interlocking the components when the tire is inflated.

# Multi-Piece and Single Rim Wheels

## 1910.177 (cont.)

- **Multi-Piece Rim** - In an accident, the wheel components separate and are released from the rim wheel with violent force. The severity of the hazard is related not only to the air pressure but also to the air volume.

# Multi-Piece and Single Rim Wheels

## 1910.177 (cont.)

- **Single Piece Rim** - A release of pressurized air can also propel the rim wheel in any potential path that a rim wheel component may travel during an explosive separation, or the area into which the air blast may be released.

# Multi-Piece and Single Rim Wheels

## 1910.177 (cont.)

- All employees working with these types of rims must be trained and evaluated!!!!

# Multi-Piece and Single Rim Wheels

## 1910.177 (cont.)

- Training
  - Contents (at a minimum):
    - OSHA Standard
    - Manufacturer's Rim Manual

# Multi-Piece and Single Rim Wheels

## 1910.177 (cont.)

- Training (cont.)
  - Demounting tires, including deflation
  - Inspecting and identifying rim wheel components
  - Installing, handling, and removing rim wheels
  - Inflating tires when single-piece rim wheels are mounted on a vehicle
  - Mounting tires, including inflating them with a restraining device or other safeguard
  - Understanding the necessity of standing outside the trajectory during inflation of the tires and of inspecting the rim wheels following inflation.

# Multi-Piece and Single Rim Wheels

## 1910.177 (cont.)

- Protection
  - Restraining Device
    - For Single or Multi-piece
  - Barrier
    - For Single Piece Only



# Multi-Piece and Single Rim Wheels

## 1910.177 (cont.)

- A barrier can be a fence, wall, or other structure placed between a single-piece rim wheel and an employee during tire inflation to contain the rim wheel components in the event of the sudden release of contained air. Each barrier or restraining device must be able to withstand the maximum force of an explosive rim wheel separation or release of the pressurized air occurring at 150 percent of the maximum tire specification pressure for the rim wheel being serviced.

# Multi-Piece and Single Rim Wheels

## 1910.177 (cont.)

- The restraining device can be a cage, rack, or an assemblage of bars and other parts that will constrain all rim wheel components during an explosive separation of the multi-piece rim wheel or during the sudden release of the contained air of a single-piece rim wheel.

# Multi-Piece and Single Rim Wheels

## 1910.177 (cont.)

- Restraining Devices (cont.)
  - Removed From Service If:
    - Cracks at Welds
    - Cracked or Broken Components
    - Bent or Sprung Components Resulting from Misuse or Explosion
    - Pitted Component from Corrosion
    - Other Component Failure or Damage

# Multi-Piece and Single Rim Wheels

## 1910.177 (cont.)

- Rim and Wheel Components
  - Inspected for Damage, Corrosion, Dirt, Oil, etc. – Before Mounting
- Size and Type of Tire and Wheel
  - Checked Prior to Assembly
  - Mismatching Avoided

# Multi-Piece and Single Rim Wheels

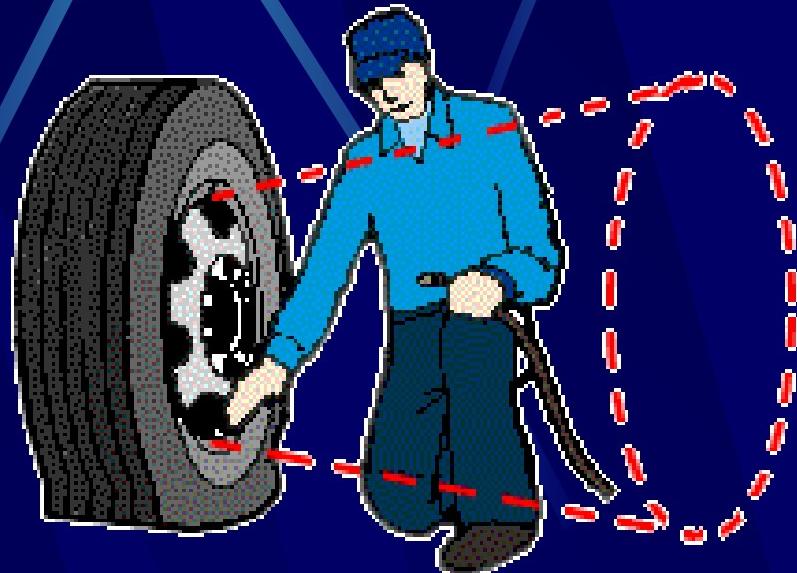
## 1910.177 (cont.)

- Multi-Piece Rim Components
  - Not Interchanged
  - Unless Allowed by Applicable Charts or Rim Manuals

# Multi-Piece and Single Rim Wheels

## 1910.177 (cont.)

- Additional ER Supplied Equip.:
  - Rim Manuals Provided
  - Only Tools Recommended in Rim Manual May be Used
  - Clip on Chuck and Sufficient Length of Hose
    - To allow EE to Stand Outside the Trajectory



# Multi-Piece and Single Rim Wheels

## 1910.177 (cont.)

- **Follow Safe Operating  
Procedures!!!!**

# Powered Industrial Trucks

## 1910.178

### Scope

- The scope provisions of 1910.178(a), which are based on ANSI B56.1 - 1969, remain in effect and cover:
  - ... fork trucks, tractors, platform lift trucks, motorized hand trucks, and other specialized industrial trucks powered by electric motors or internal combustion engines.
  - It does not apply to compressed air or nonflammable compressed gas-operated industrial trucks, farm vehicles, nor vehicles intended primarily for earth moving or over-the-road hauling.

# Powered Industrial Trucks

## 1910.178 (cont.)

- This scope covers general industry, construction and shipyards.

# Definitions

- A mobile, power-propelled truck used to carry, push, pull, lift, stack or tier materials. [American Society of Mechanical Engineers (ASME) definition]
- Commonly known as forklifts, pallet trucks, rider trucks, forktrucks, or lifttrucks.

# Statistics

- Powered industrial truck accidents cause approximately 100 fatalities and 36,340 serious injuries in general industry and construction annually.
- It is estimated that 20 - 25% of the accidents are, at least in part, caused by inadequate training.

**Bay  
Lines, inc.**

A TRUCKING SERVICE



# THIS ACCIDENT SHOULD HAVE BEEN PREVENTED



# General Req.

- Modifications
  - Manufacturer's written approval
- Operating Atmosphere
  - Hazardous or Non-hazardous
    - Determined before use
  - Table N-1 1910.178(c)(2)

# General Req. (cont.)

## ● 11 Designation of trucks

- Based on protection and power supply
  - D
  - DS
  - DY
  - E
  - ES
  - EE
  - EX
  - G
  - GS
  - LP
  - LPS

# General Req. (cont.)

- Training
  - No operation unless properly trained and Authorized
  - **INCLUDING SUPERVISORS!!!**
  - New standard
- “Approved Trucks”
  - Bear label from testing laboratory

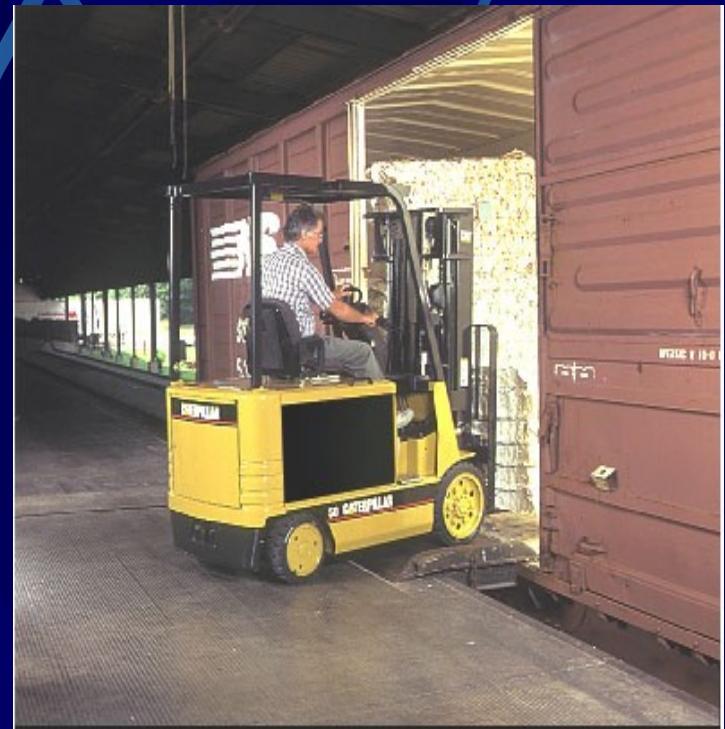
# Operator Training

## ● Safe operations

- The employer shall ensure that each powered industrial truck operator is competent to operate a powered industrial truck safely, as demonstrated by successful completion of the training and evaluation specified in the OSHA standard.
- Prior to permitting an employee to operate a powered industrial truck (except for training purposes), the employer shall ensure that each operator has successfully completed the required training (or previously received appropriate training).

# Training Program Implementation

- Trainees may operate a powered industrial truck only:
  - Under direct supervision of a person who has the knowledge, training, and experience to train operators and evaluate their competence; and,
  - Where such operation does not endanger the trainee or other employees.



Sit Down Rider - Electric

# Training Program Implementation (continued)

- Training shall consist of a combination of:
  - ◆ Formal instruction (e.g., lecture, discussion, interactive computer learning, written material),
  - ◆ Practical training (demonstrations and exercises performed by the trainee), and
  - ◆ Evaluation of the operator's performance in the workplace

# Training Program Implementation (continued)

- Training and evaluation shall be conducted by a person with the knowledge, training and experience to train powered industrial truck operators and evaluate their competence.



# Training Program Content

- Operators shall receive initial training in the following topics, except in topics which the employer can demonstrate are not applicable to safe operation in the employer's workplace.
  - Truck-related topics
  - Workplace-related topics
  - The requirements of the standard

# Training Program Content (continued)

## ■ Truck-related topics

- Operating instructions, warnings and precautions
- Differences from automobile
- Controls and instrumentation
- Engine or motor operation
- Steering and maneuvering
- Visibility
- Fork and attachment adaptation, operation, use
- Vehicle capacity and stability
- Vehicle inspection and maintenance that the operator will be required to perform
- Refueling/Charging/ Recharging batteries
- Operating limitations
- Other instructions, etc.

# Training Program Content

## (continued)

### ■ Workplace-related topics

- Surface conditions
- Composition and stability of loads
- Load manipulation, stacking, unstacking
- Pedestrian traffic
- Narrow aisles and restricted areas
- Operating in hazardous (classified) locations
- Operating on ramps and sloped surfaces
- Potentially hazardous environmental conditions
- Operating in closed environments or other areas where poor ventilation or maintenance could cause carbon monoxide or diesel exhaust buildup

# Training Program Content (continued)

- The requirements of the OSHA standard on powered industrial trucks must also be included in the initial operator training program.

# Refresher Training and Evaluation

- An evaluation of each powered industrial truck operator's performance must be conducted:
  - After initial training,
  - After refresher training, and
  - At least once every three years

# Refresher Training and Evaluation (cont.)

Refresher training required when:

- Unsafe operation
- Accident or near-miss
- Evaluation indicates need
- Different type of equipment introduced
- Workplace condition changes

# Avoidance of Duplicative Training

- If an operator has previously received training in a topic specified in this section, and the training is appropriate to the truck and working conditions encountered, additional training in that topic is not required if the operator has been evaluated and found competent to operate the truck safely.

# Safety Guards



**Sit Down Rider Fork  
- LPG**



- Overhead guards
  - On high lift trucks
  - Exception:

- If operations or environment don't permit space for them.



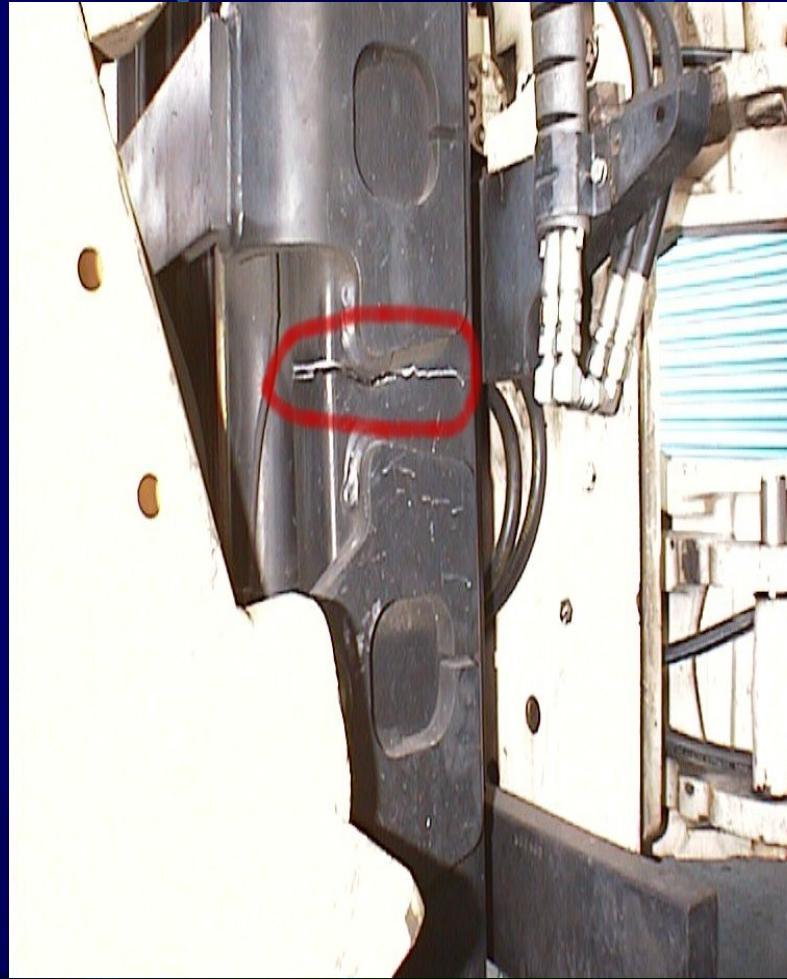
- Back rest

- If load presents a hazard of falling back on operator.

# Pre-Operational Inspection

- All Fluid Levels
- Tires
- Hoses/Belts/Cables
- Mast/Forks
- Fuel/Battery Level
- Safety Equipment
- Gauges/Controls
- Horns/Alarms
- Steering
- Brakes
- Leaks

# Hazard???



# Loading and Unloading



## Trucks and Railcars

- Wheel chocks
  - Set parking brake
- Rail stops

# Unattended Trucks

- Unattended:
  - Operator is More Than 25ft. From Truck
  - Truck Is No Longer In Operator's View
- Load Engaging Means Fully Lowered
- Controls Neutralized
- Power Shut Off
- Brakes Set
- Wheels Chocked if On an Incline

2 INCH HF COM  
JACK HERE >



# Gasoline or Diesel

- Never fuel the forklift near an open flame or heat source
  - **NO SMOKING ALLOWED**
- Turn the unit off before refueling
- Make sure the operator knows which type of fuel to add

# Battery Powered

- Battery changing installations
  - Designated areas
- Areas must be provided with:
  - Apparatus to neutralize spilled electrolyte
  - Fire Protection
  - Protection for charging apparatus (from damage)
  - Hoist (or equivalent) for handling batteries

# Overhead and Gantry Cranes

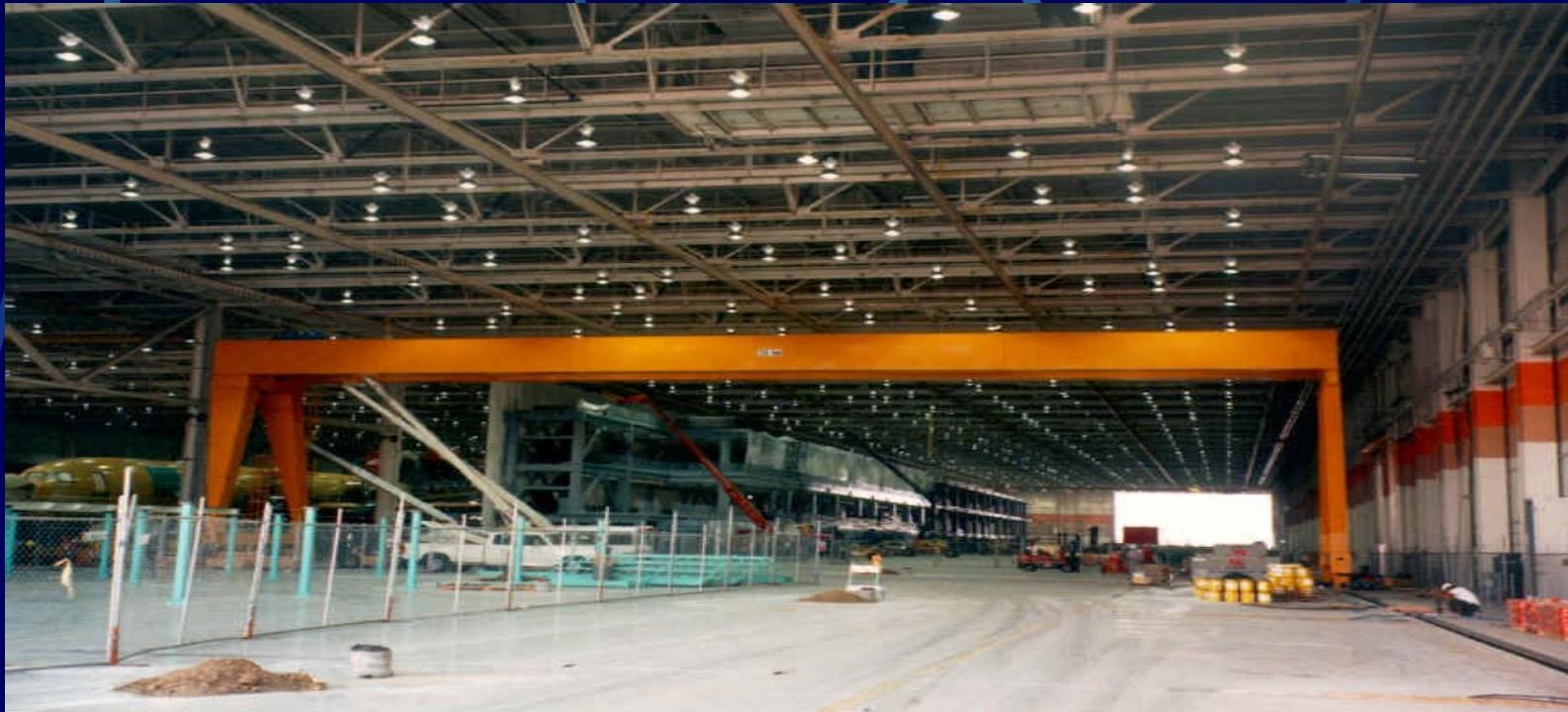
## 1910.179

### Overhead and Gantry Cranes

- |                              |                        |
|------------------------------|------------------------|
| — General Requirements       | — Guards               |
| — Cabs                       | — Hoisting Equipment   |
| — Footwalks and Ladders      | — Brakes               |
| — Stops                      | — Electrical Equipment |
| — Bridge and Trolley Bumpers | — Inspection           |
| — Rail Sweeps                | — Handling the Load    |

# Overhead and Gantry Cranes

1910.179



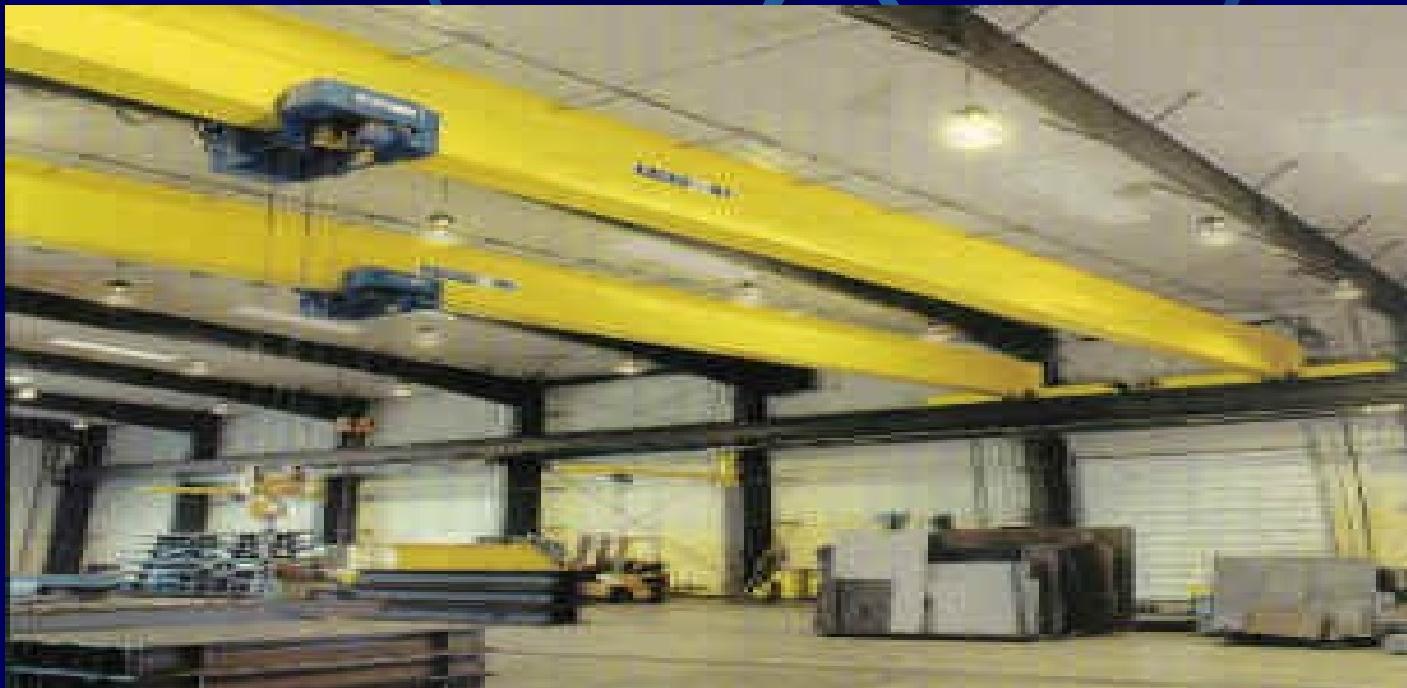
# Overhead and Gantry Cranes

1910.179



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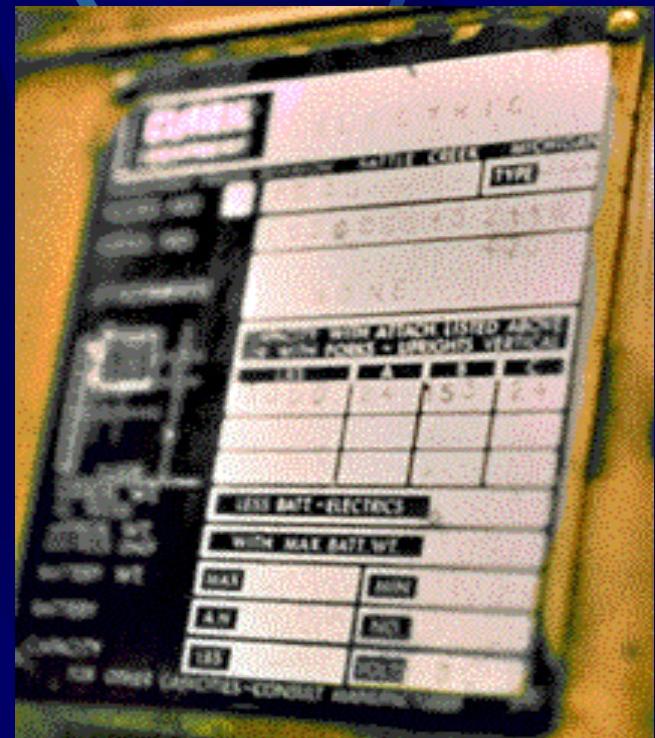


# Overhead and Gantry Cranes

## 1910.179

### General

- Rated Load Marked
- If More Than One Hoisting Unit:
  - Both Marked on it or its Load Block
- Qualified Operators
- Preventative Maintenance Program



# Overhead and Gantry Cranes

## 1910.179

- Cabs

- Operating Handles Within Reach of the Operator
- Shall Allow Full View of the Load Hook
- Access to Cab Checked Thoroughly

# Overhead and Gantry Cranes

## 1910.179

### ● Cabs (cont.)

- Bridge Footwalks (if provided)
  - 50 psf
  - Guardrails
- Access by Fixed Ladder
- Platform (if provided)
  - Step Across Distance Not to Exceed 12"



# Overhead and Gantry Cranes

## 1910.179

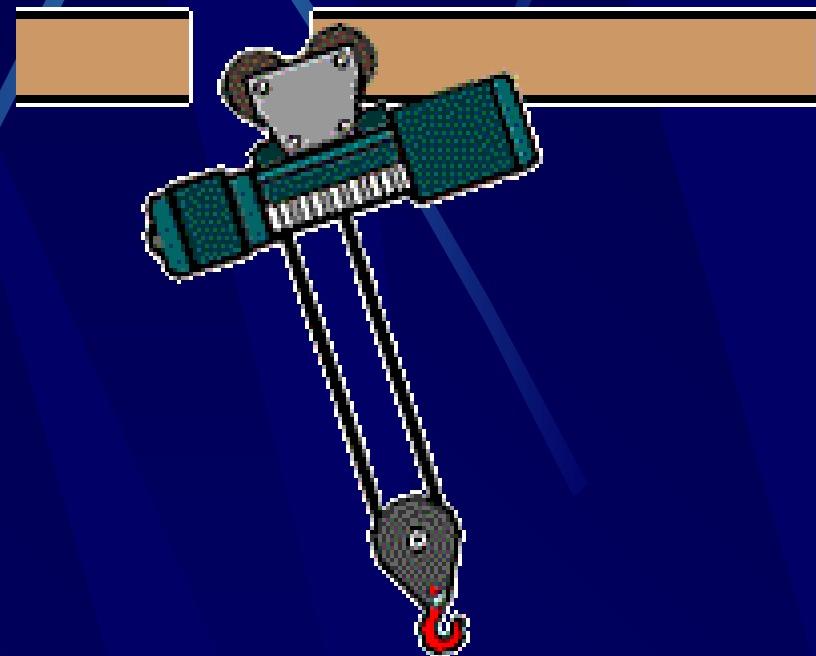
- Stops
  - Limits a trolley's travel
  - Provided on top running hoists
  - Inspected by the Bridge Footwalk

# Overhead and Gantry Cranes

## 1910.179

### Stop Hazards

- Running off the trolley runway
- Falling to the floor
- Losing parts which fall and hit employees below
- Dropping or unexpectedly moving the load
- Contacting runway conductors and causing the entire crane to become energized.

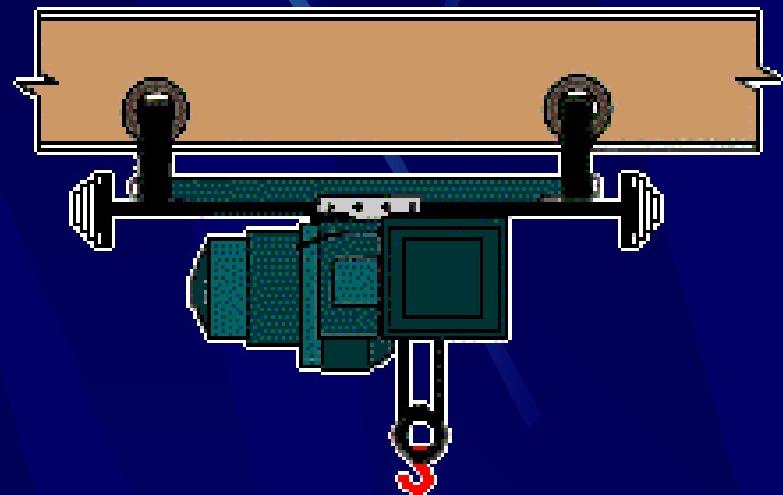


# Overhead and Gantry Cranes

## 1910.179

- Bridge and Trolley  
Bumpers

- Reduces Impact  
When
  - Crane Reaches the  
End of Travel  
Distance
  - Two or more  
Cranes Contact

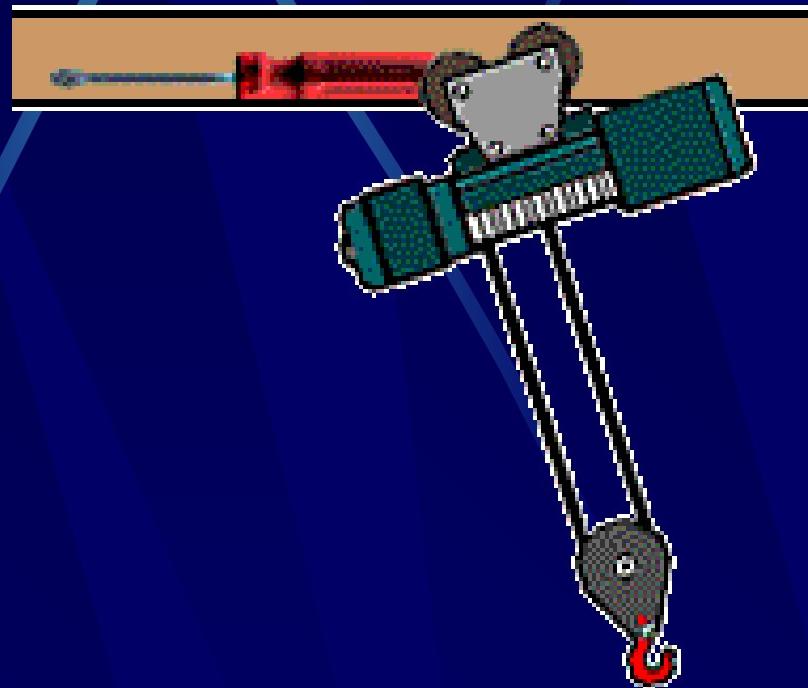


# Overhead and Gantry Cranes

## 1910.179

- Rail Sweeps

- Protect From Derailment
  - Tools Left on Rail
- Protect From Injury



# Overhead and Gantry Cranes

## 1910.179

- Guards
  - Bridge Conductors and Hoisting Ropes
  - Moving Parts Near the Footwalk
    - Shaft ends, Chain and Sprockets, Gears, etc.

# Overhead and Gantry Cranes

## 1910.179

### Hoisting Equipment

- Sheaves
  - Clear and Free
- Sheaves in Bottom Blocks
  - Close Fitting Guards to Prevent Fouling of Ropes
- Hook – In Extreme Low Position
  - No Less Than 2 Wraps on the Drum



# Overhead and Gantry Cranes

## 1910.179

- Brakes
  - Holding Brake
    - On All Cranes
  - Coasting Brake
    - On all Floor Operated or Remote Operated Cranes
  - Trolley Brake
    - If Cab Operated

# Overhead and Gantry Cranes

## 1910.179

- Electrical
  - Comply with Subpart S
  - Strain Relief
  - Pendant Controls Marked
  - Limit Switch

# Overhead and Gantry Cranes

## 1910.179

### ● Inspections

- Prior to Use/Alteration/Repair
- Daily to Monthly
- Monthly to Yearly

### **Monthly Inspection Certificate**

This certificate is issued to the owner or operator of the crane listed below, indicating that it has been visually inspected and found to be in safe operating condition. This certificate is valid for one year from the date of issue.

**Date:**

**Serial Number:**

**Inspector's Signature:**

# Crawler, Locomotive, and Truck Cranes

## 1910.180

- Must also meet ANSI B30.5-1968
- Have Qualified Operators

# Crawler, Locomotive, and Truck Cranes 1910.180

- Load Ratings
    - Chart Must be Located and Observable to Operator

## Load Rating Chart

The standard of living in third world countries is much lower than that of countries which are first world. If I were a rich man, or woman, I would not work at all. I would stay home and rest. I would take art classes and travel around the world. My also play has completely spread out in the past three I reported it. I would not totally take away nothing classes.

# Crawler, Locomotive, and Truck Cranes

## 1910.180

- Inspections
  - New/Altered/Repaired
  - Frequent
  - Regular

# Crawler, Locomotive, and Truck Cranes

## 1910.180

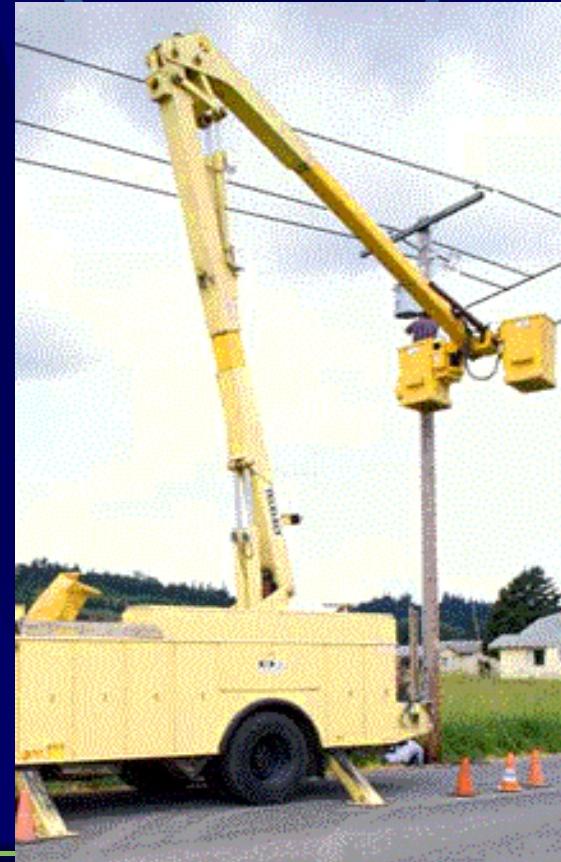
- Handling the Load
  - Don't Exceed Rated Capacity
    - Below the Hook Lifting Devices
  - Don't Wrap Hoist Rope Around Object to be Lifted
  - Outriggers
  - Operators
    - Don't Leave Controls While Load Suspended

# Crawler, Locomotive, and Truck Cranes

## 1910.180

- Electric Lines

- 1910.333
- Clearances
  - 10ft. + 4 inches for every 10kv over 50kv
  - Twice the length of the line insulator
  - Never less than 10ft.



# Derricks 1910.181

- Types
  - Guy
  - Chicago
  - Basket
  - A Frame
  - Stiffleg
- Must Meet ANSI B30.6-1969

# Derricks 1910.181



# Derricks

# 1910.181

- Load Rating
- Inspection
- Testing and Maintenance
- Handling the Load
- Operating Near Electric Lines

# Helicopters 1910.183

- Sections
  - Communication
  - Handling the Load
  - Protective Measures
- Must Meet FAA Guidelines

# Helicopters

## 1910.183

- Communication
  - Briefing Before Operations
  - Training on Signaling Systems
    - Hand Signaling Chart
  - Pilot/Ground Crew Communication
    - Ground Crew Distinguishable



# Helicopters

## 1910.183

- Handling the Load

- Tag Lines Long Enough Not to Get Pulled Into Rotors
- Electric Cargo Hooks
  - Prevented from unintended operation
  - Emergency means of releasing the load
- Release of static discharge
- All loose material secure within 100ft.

# Helicopters

## 1910.183

- Protective Measures
  - PPE
    - Eye Protection
    - Hard Hats with Chin Straps
  - No Approach Within 50ft.
    - Except for qualified personnel



# Slings

## 1910.184

### General Safety

- Damaged or Defective Slings Not Used
- Not Shorted by Knots, Bolts, etc.
- Not Overloaded – Rated Capacity
- Securely Attached
- Padded or Protected from Sharp Edges
- Hand and Fingers Not Placed Between Load and Sling
- Not Pulled from Under a Resting Load

# Slings 1910.184

- Inspections
  - Inspected - Daily
  - By a Competent Person

# Slings

## 1910.184

- Alloy Steel Chain Slings
  - Sling Identification
    - Size
    - Grade
    - Rated Capacity
    - Length
  - Make Shift Fasteners Prohibited

# Slings

## 1910.184

- Alloy Steel Slings (cont.)
  - Inspections
    - At Least Once a Year
    - More Frequently Based on Type of Use
  - Document
  - Remove From Service
  - Performed by a Competent Person

# Slings 1910.184

- Proof Testing
  - New, Repaired, Reconditioned
    - In Accordance with ASTM A391-65
- Rating
  - Tables N-184-1



# Slings

## 1910.184

- Removal From Service
  - Link Worn In Excess of Table N-184-2
  - Cracked or Deformed Links
  - Hooks
    - Cracked
    - Throat Opened More Than 15 Percent of Normal
    - Twisted More Than 10 Degrees

# Slings

# 1910.184

- Wire Rope
  - Not To Exceed Rated Capacity
  - In Accordance with Tables N-184-3 and N-184-14

# Slings

## 1910.184

- Removal of Service
  - Ten Random Broken Wires in One Rope Lay
  - Five Broken Wires in One Strand
  - Wear or Scraping of 1/3 Original Dia. Of Outside Wires
  - Kinking, Crushing, Bird Caging
  - Heat Damage
  - Damage to End Attachments

# Slings 1910.184

- Removal From Service (cont.)
  - Hook Throat Opened More Than 15 Percent of Normal
  - Hook With More Than 10 Degree Twist From Normal
  - Corrosion

# Slings 1910.184

- Metal Mesh Slings

- Marked with Rating for:
  - Basket Hitch
  - Choker Hitch
- Rated Capacity
  - In Accordance with Table N-184-15

# Slings 1910.184

- Removal From Service

- Broken Weld or Joint Along the Sling Edge
- Reduction In Diameter by 25 Percent from Abrasion or 15 Percent by Corrosion
- Distortion of Handles

# Slings

# 1910.184

- Natural and Synthetic Rope
  - Comply with Tables:
    - N-184-16
    - N-184-19
    - N-184-4
    - N-184-5

# Slings

## 1910.184

- Removal from Service
  - Abnormal Wear
  - Powder Fiber Between Strands
  - Broken or Cut Fibers
  - Variation of Size or Roundness of Fibers
  - Discoloration or Rotting
  - Distortion of Hardware in Slings
- Rope Slings Cannot Be Repaired

# Slings

# 1910.184

- Synthetic Web Slings

- Marked to Show Rating Based on Material and Hitch
- Uniform in Thickness

# Slings

## 1910.184

- Removal from Service
  - Acid or Caustic Burns
  - Melting or Charring of Sling Surface
  - Snags, Punctures, Tears, or Cuts
  - Broken or Worn Stitches
  - Distortion of Fittings